using $\phi(t) = \arctan\frac{\hat{x}(t)}{x(t)}$, where $\hat{x}(t)$ is the Hilbert transform of the signal represented by the first data and x(t) is the signal represented by the first data.

A1 cont.

3. (Amended) A method as claimed in claim 2, in which the step of providing the measure of structural health comprises the step of determining an amplitude of the phase modulation.

5. (Amended) A method as claimed in claim 1, in which the step of identifying at least one phase characteristic comprises the step of taking the Fourier transform of the first data and applying the convolution theorem which gives

$$F[\hat{x}(t)] = \hat{X}(f) = X(f)\{-j\,\mathrm{sgn}(f)\},$$

A2

where sgn(f) is the signum function defined as

$$\mathrm{sgn}(f) = \begin{cases} 1 & for \quad f \geq 0 \\ -1 & for \quad f < 0 \end{cases},$$ where f is frequency.

8. (Amended) A method as claimed in claim 6, in which the phase difference is calculated using a cross-correlation function

A3

$$R(\tau_i) = \sum_{t=1}^{N} x_{ref}(t)x(t+\tau),$$

where $R(\tau_i)$ is the cross-correlation function between the first and second data and N is the number of data samples of the first and second data.

10. (Amended) A method as claimed in claim 6, in which the step of providing comprises the step of identifying the magnitude of the instantaneous phase difference between the first and second data.

11. (Amended) A method as claimed in claim 1, in which the guided wave is a Lamb wave.

A4

12. (Amended) A method as claimed in claim 1, further comprising the steps of attaching a first transducer to the body and applying the excitation signal to the first transducer to induce the propagation of the guided wave within the body.

13. (Amended) A method as claimed in claim 12, further comprising the step of attaching a second transducer to the body and measuring the response of the second transducer to the presence of the guided wave.

14. (Amended) A method as claimed in claim 13, further comprising the steps of applying a third transducer to the body and applying a second excitation signal to the third transducer.

15. (Amended) A method as claimed in claim 1, in which at least one excitation signal applied to a transducer is arranged to produce a guided wave having a predetermined frequency.

17. (Amended) A method as claimed in claim 1, in which at least one excitation signal is arranged to have at least one predetermined frequency component.

A5

18. (Amended) A method as claimed in claim 17, in which the at least one predetermined frequency component comprises at least one frequency component that is related to at least one of a desired mode of propagation of the guided wave and the thickness of the material under test, preferably, the at least one predetermined frequency component comprises at least one frequency component in the range 80 KHz to 10 MHz.

19. (Amended) A method as claimed in claim 17, in which the at least one predetermined frequency component comprises at least one frequency component in the range 1 Hz to 10 KHz.

A5 cont.

20. (Amended) A method as claimed in claim 1, in which at least one excitation frequency is selected to induce a predetermined mode of propagation of the guided wave within the body.

21. (Amended) A method as claimed in claim 12, in which a predetermined frequency of the excitation signal is selected according to a resonant mode of the first transducer.

22. (Amended) A method as claimed in claim 3, in which the step of providing the measure of structural health comprises the step of comparing the amplitude of the phase modulation with an amplitude of at least one excitation signal.

A6

24. (Amended) An apparatus for determining the structural health of a body, the apparatus comprising means for identifying at least one phase characteristic of a signal represented by first data, the first data being derived from the body while bearing at least a guided wave produced in response to application of at least one excitation signal to the body, and means for providing a measure of the structural health of the body using the at least one phase characteristic.

A7

28. (Amended) An apparatus as claimed in claim 24, in which the means for identifying comprises means for taking the Fourier transform of the first data and means for applying the convolution theorem which gives

$$F[\hat{x}(t)] = \hat{X}(f) = X(f)\{-j\,\mathrm{sgn}(f)\},$$

where sgn(f) is the signum function defined as

$$\operatorname{sgn}(f)=\begin{cases}1 & \text{for } f \geq 0 \\ -1 & \text{for } f<0\end{cases}$$, where f is frequency.

A7 cont.

29. (Amended) An apparatus as claimed in claim 24, in which the means for identifying comprises means for comparing the first data with second data, representing at least one excitation signal launched into the body to produce a guided wave within the body, to identify a phase difference between the first and second data; and in which the at least one phase characteristic comprises the phase difference.

31. (Amended) An apparatus as claimed in claim 29, in which the phase difference is calculated using a cross-correlation function

A8

$$R(\tau)=\sum_{t=1}^{N} x_{ref}(t) x(t+\tau),$$

where $R(\tau_i)$ is the cross-correlation function between the first and second data and N is the number of data samples of the first and second data.

33. (Amended) An apparatus as claimed in claim 29, in which the means for providing a measure of the structural health of the body comprises means for identifying the magnitude of the instantaneous phase difference between the first and second data.

A9

34. (Amended) An apparatus as claimed in claim 24, in which the guided wave is a Lamb wave.

35. (Amended) An apparatus as claimed in claim 24, further comprising means for attaching a first transducer to the body and means for applying the excitation signal to the first transducer to induce the propagation of the guided wave within the body.

36. (Amended) An apparatus as claimed in claim 35, further comprising means for attaching a second transducer to the body and means for measuring the response of the second transducer to the presence of the guided wave.

A9 cont.

37. (Amended) An apparatus as claimed in claim 36, further comprising means for applying a third transducer to the body and means for applying a second excitation signal to the third transducer.

38. (Amended) An apparatus as claimed in claim 35, in which at least one excitation signal applied to the transducer is arranged to produce a guided wave having a predetermined frequency.

40. (Amended) An apparatus as claimed in claim 24, in which at least one excitation signal is arranged to have at least one predetermined frequency component.

A10

41. (Amended) An apparatus as claimed in claim 40, in which the at least one predetermined frequency component comprises at least one frequency component that is related to at least one of desired mode of propagation of the guided wave and the thickness of the material under test and preferably comprises at least one frequency component in the range of 80 KHz to 10 MHz.

42. (Amended) An apparatus as claimed in claim 40, in which the at least one predetermined frequency component comprises at least one frequency component in the range of 1 Hz to 10 KHz.

43. (Amended) An apparatus as claimed in claim 24, in which at least one excitation signal has frequency selected to induce a predetermined mode of propagation of the guided wave within the body.

44. (Amended) An apparatus as claimed in claim 35, in which at least one excitation signal has a predetermined frequency selected according to a resonant mode of the first transducer.

A10 cont.

45. (Amended) An apparatus as claimed in claim 24, in which the means for providing the measure of structural health comprises means for comparing the amplitude of the phase modulation with the amplitude of the excitation signal.

A11

47. (Amended) A computer program for product, residing on a computer readable medium for determining the structural health of a body, identifying at least one phase characteristic of a signal represented by first data, the first data being derived from the body while bearing at least a guided wave produced in response to application of at least one excitation signal to the body, and providing a measure of the structural health of the body using the at least one phase characteristic.